

# (12) UK Patent Application (19) GB (11) 2 159 051 A

(43) Application published 27 Nov 1985

(21) Application No 8425990

(22) Date of filing 23 Jul 1982

Date lodged 15 Oct 1984

(30) Priority data

(31) 8122713 (32) 23 Jul 1981 (33) GB  
8122801 23 Jul 1981

(60) Derived from Application No. 8221314 under Section 15(4) of the Patents Act 1977

(51) INT CL<sup>4</sup>  
A62C 3/14

(52) Domestic classification  
A5A 23  
F4V A1A A1E A2A1 A2B

(56) Documents cited  
GB A 2107183 GB 1500913  
GB 1591612 GB 1500912  
GB 1532410 GB 0368424

(58) Field of search  
A5A

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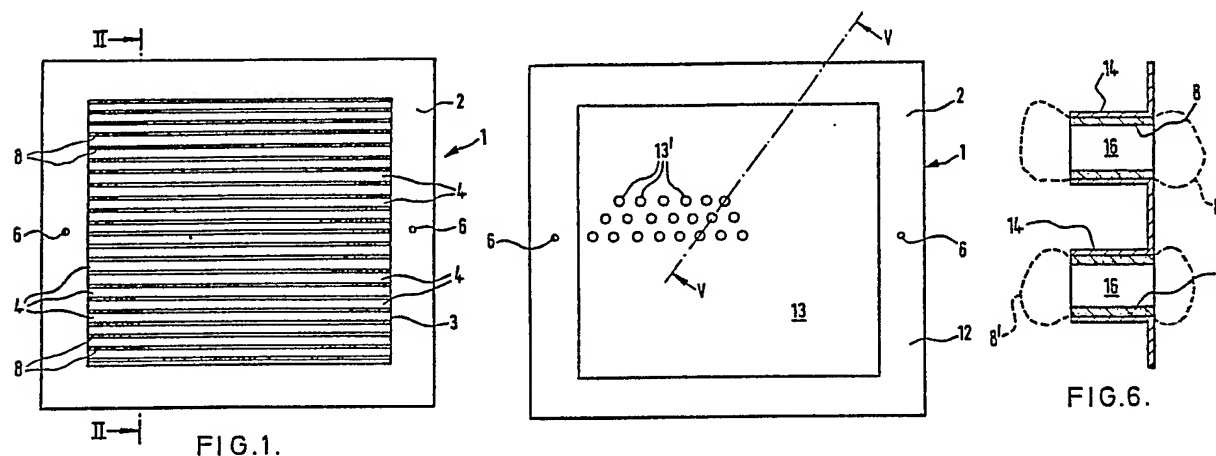
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## (54) Panel device for a ventilation opening

(57) The invention provides a panel device (1) for an opening, such as a ventilation opening, comprising a panel (2) having perforations (13') formed therein, a tubular flange (14) extending rearwardly from each perforation and having present on its inner surface a coating of intumescent material (8), an opening or passage (16) through each tubular flange being left, the intumescent material, when exposed to elevated temperature intumescing to close the openings or passages.

The invention provides a louvre panel device for an opening, comprising a panel (1) provided with one or more louvres (4) and which carries intumescent material (8) on its back, the intumescent material when exposed to elevated temperature intumescing and thereby closing the gaps provided by the louvres.

In one embodiment the panel (1) has an array of angled louvres (4), on the rear sides of which is present the intumescent material (8).



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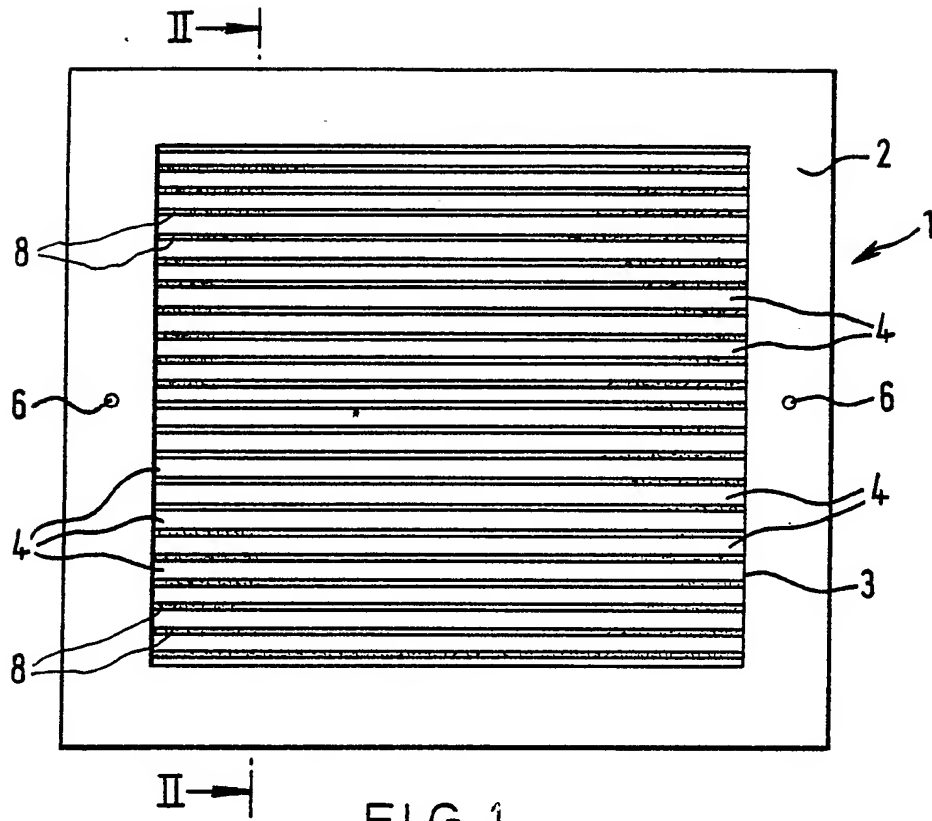


FIG. 1.

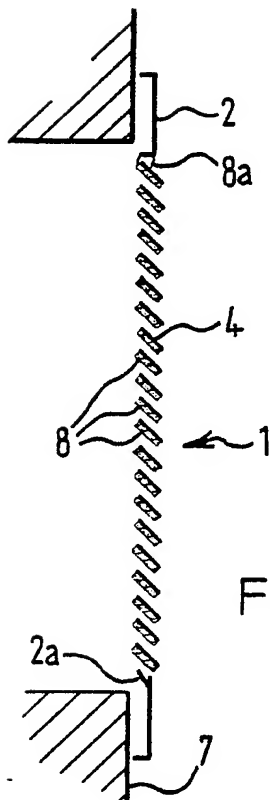


FIG. 2.

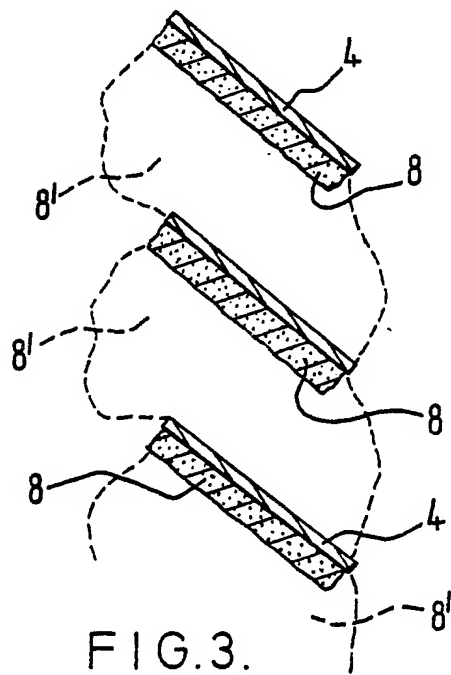


FIG. 3.

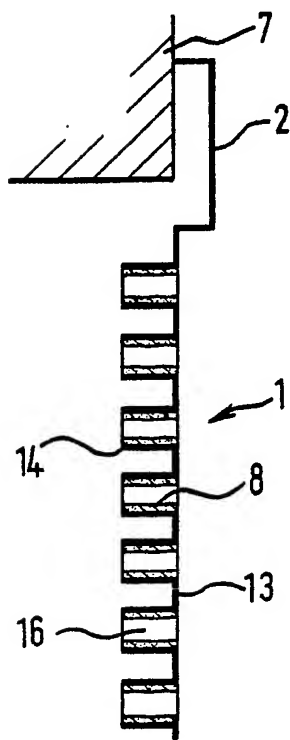
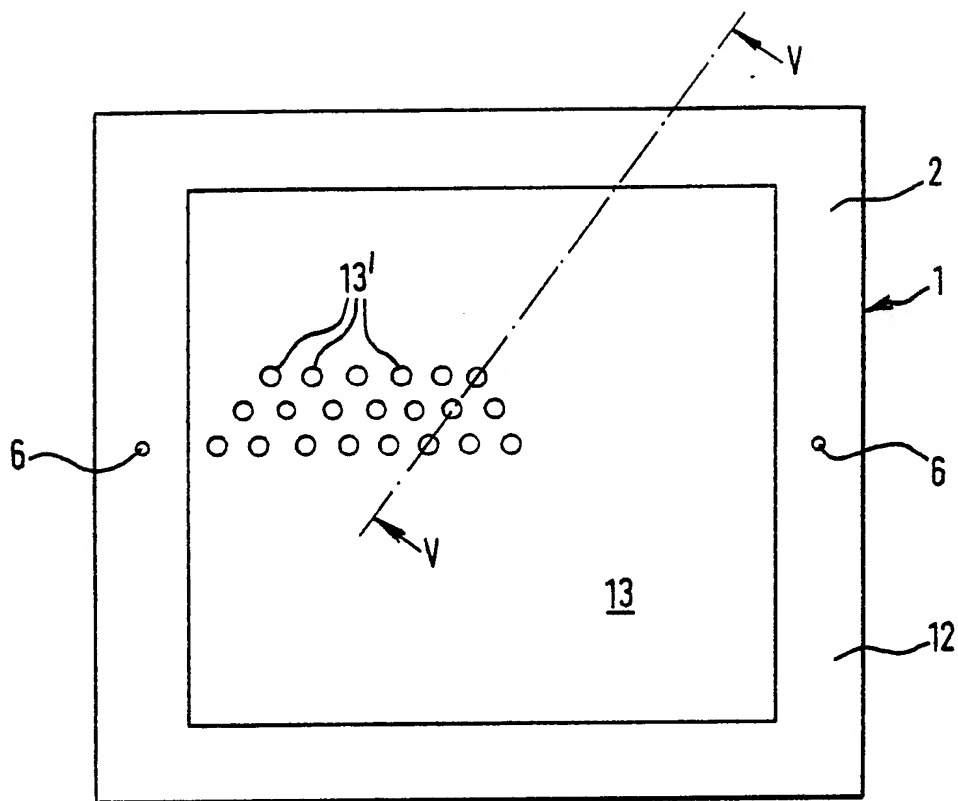


FIG.5.

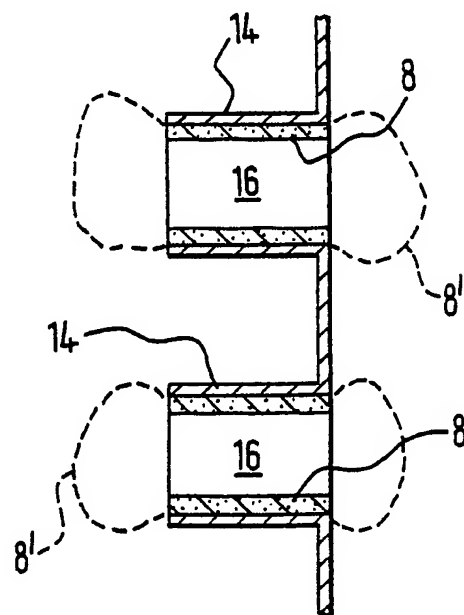


FIG.6.

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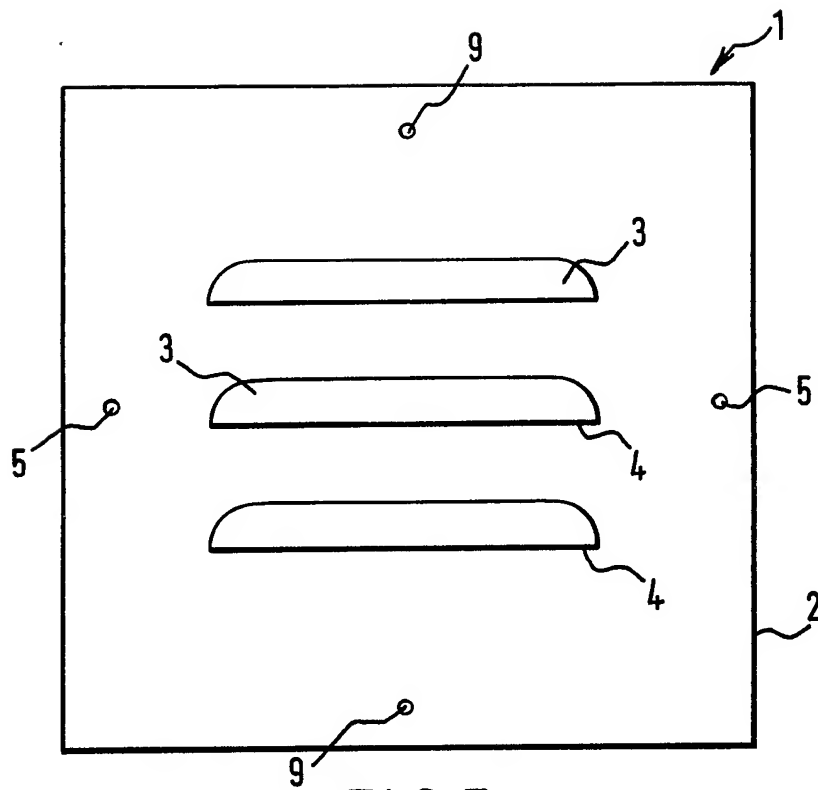


FIG. 7.

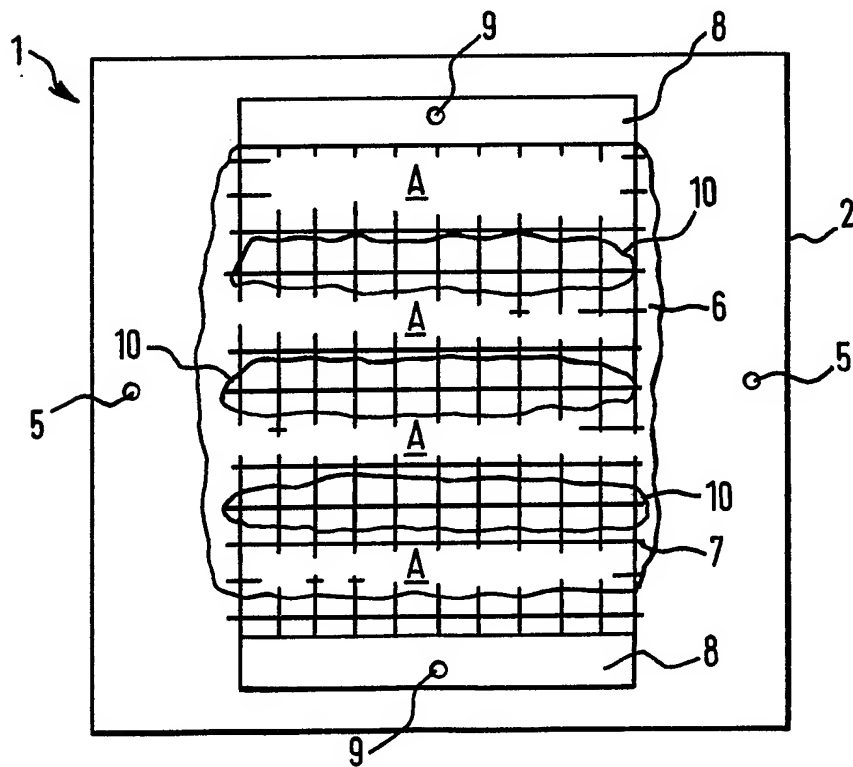


FIG. 8.

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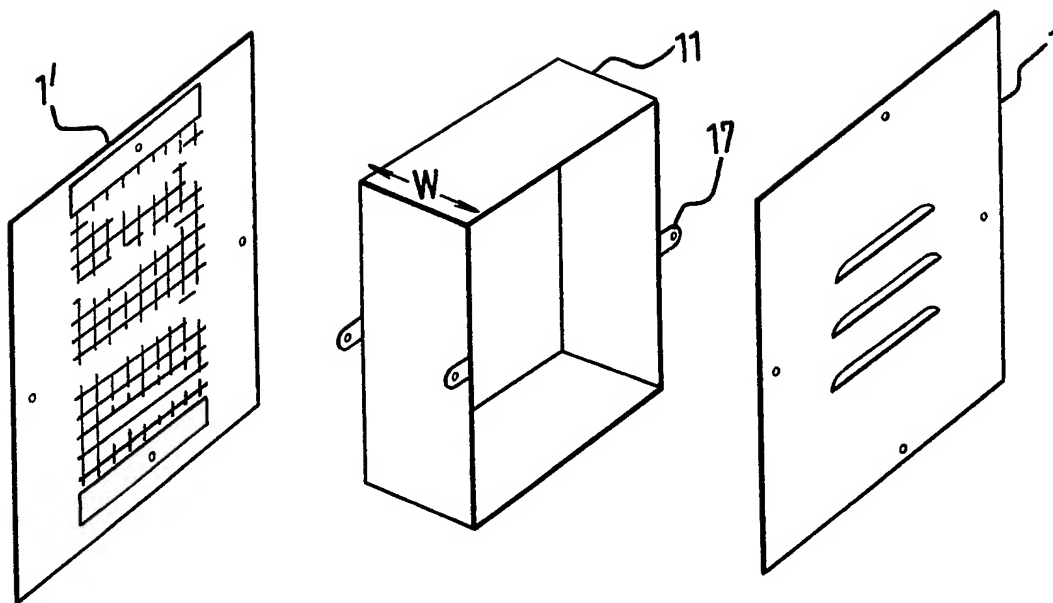


FIG. 9.

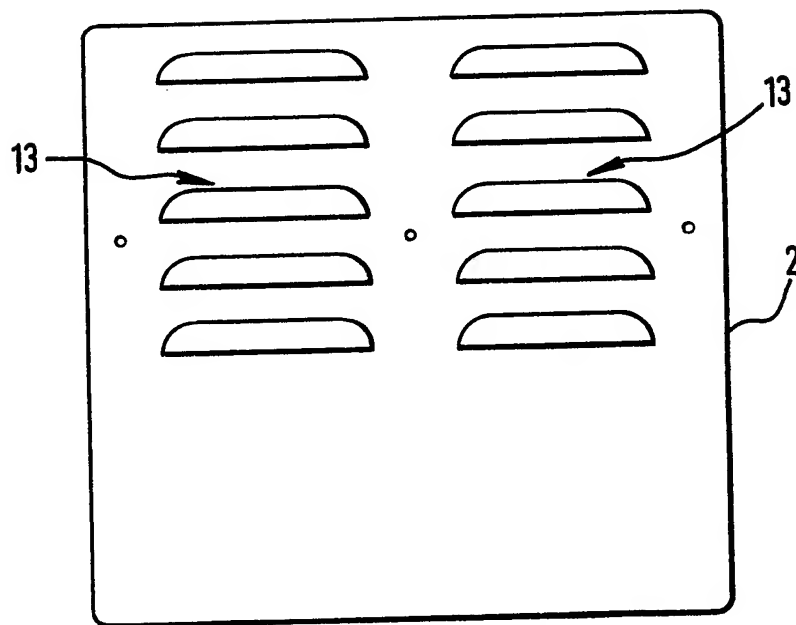


FIG. 10.

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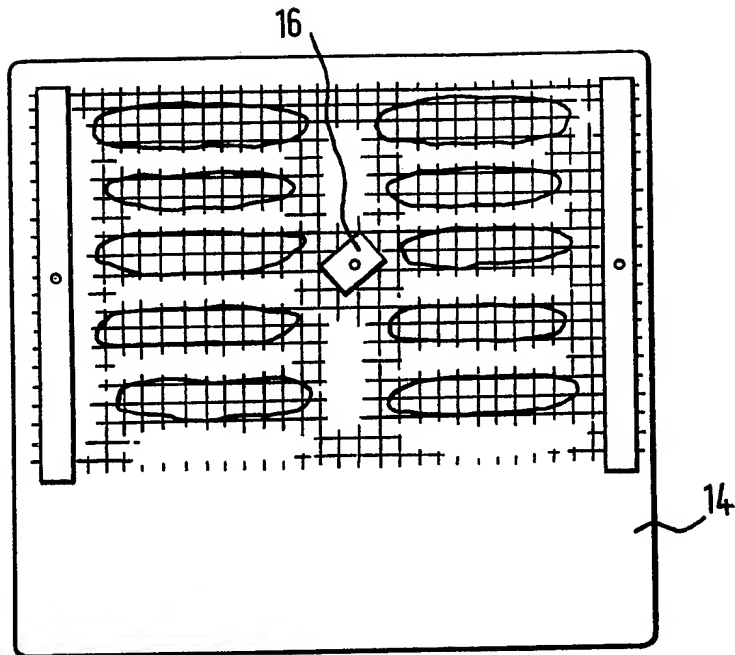


FIG. 11.

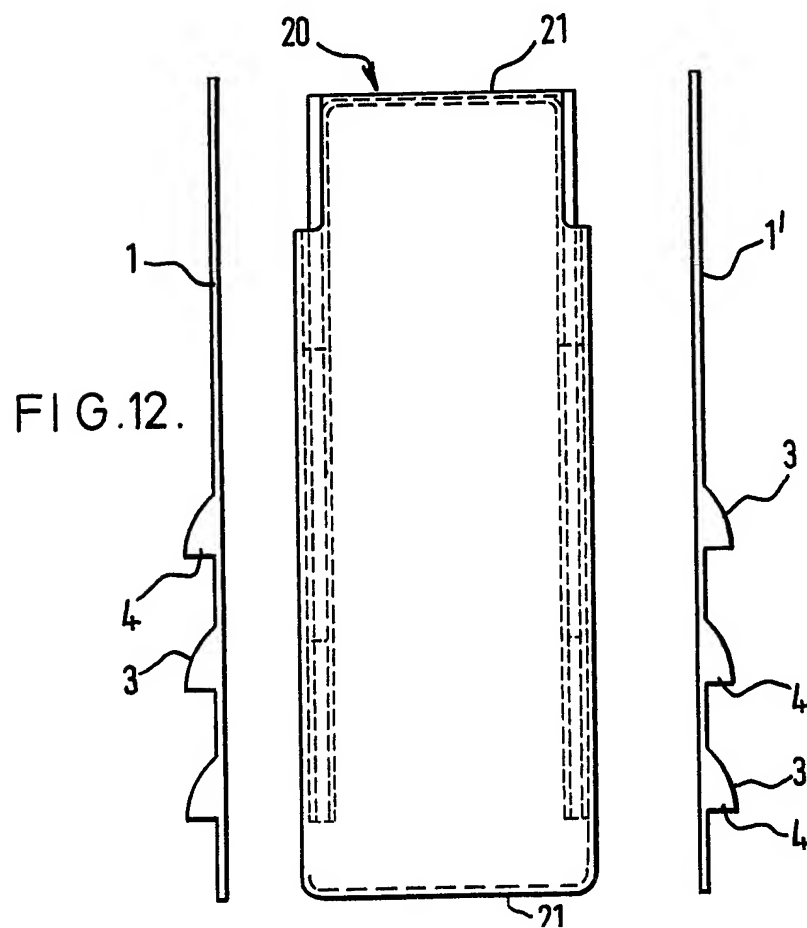


FIG. 12.

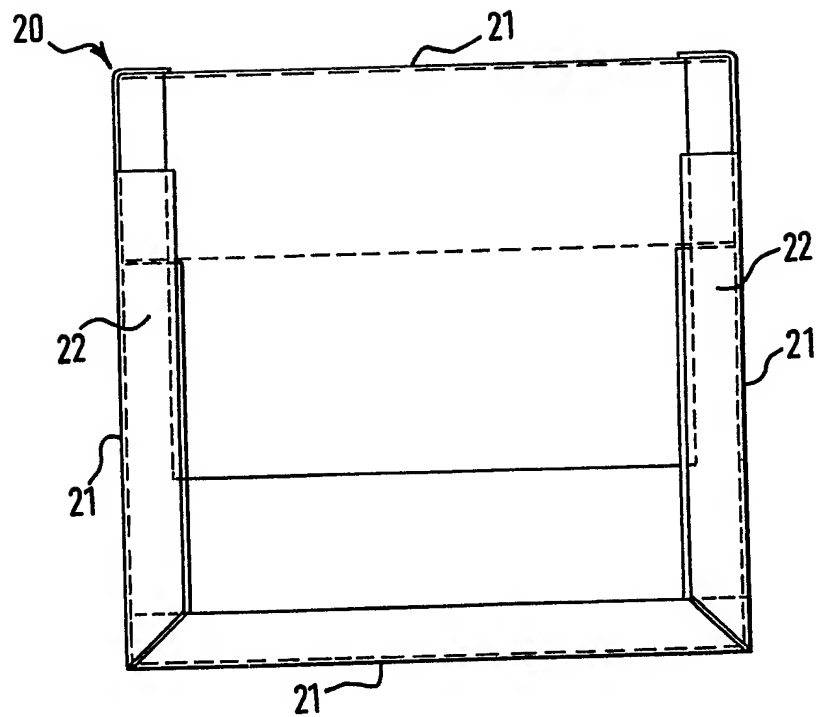


FIG. 13.

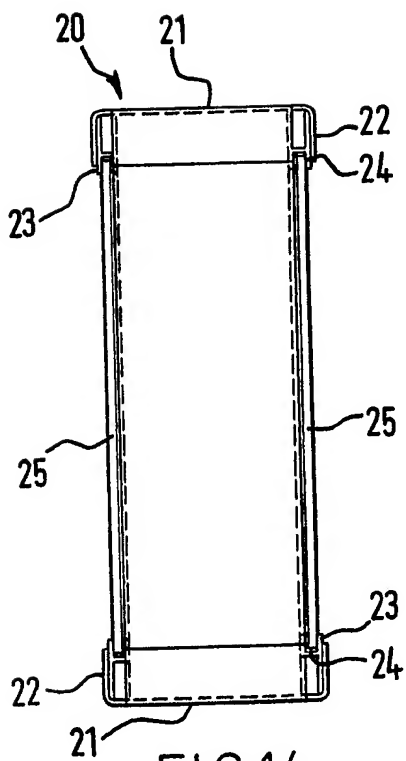


FIG. 14

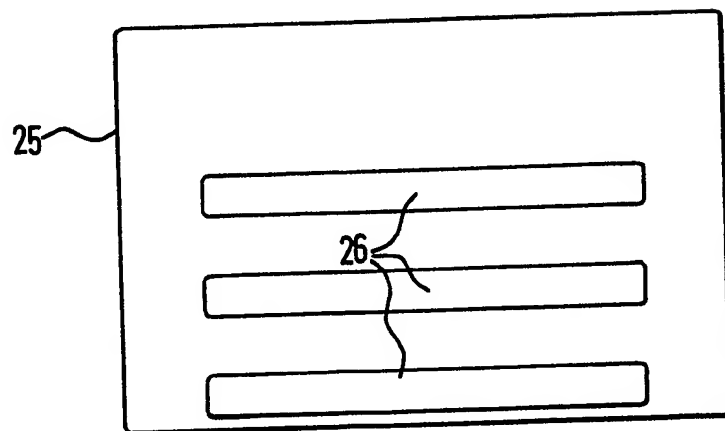


FIG. 15.

## SPECIFICATION

## Panel device for a ventilation opening

The present invention relates to a panel device for covering an opening such as a ventilation opening in a door or an inlet or outlet opening of a ventilation duct or for use as a speaker grille.

Openings, such as referred to above, are often provided with a louvre panel for aesthetic purposes, to prevent articles being accidentally or maliciously inserted into the opening and, where the opening is a ventilation outlet, to provide an evenly distributed flow of air through the opening or, where the opening is a ventilation inlet, to prevent articles such as clothing being drawn into the opening and, where the opening is exposed to the weather, to prevent rain or snow entering the opening.

In the event of fire, despite the presence of the louvre panel, the openings serve to assist in the spread of smoke, noxious combustion gases and the fire itself. In order to prevent this, it is known to provide within the opening, adjacent the louvre panel, a device comprising intumescent material. In the event of a fire, the intumescent material when exposed to elevated temperature is intended to intumesce thereby to block the opening. However, such known devices comprising intumescent material are complicated and hence expensive and have proved unsatisfactory.

The present invention aims to overcome or mitigate the aforementioned disadvantages.

To this end, the present invention provides a louvre panel device, for an opening, such as a ventilation opening, comprising a panel provided with one or more louvres and which carries intumescent material on its back, the intumescent material when exposed to elevated temperature, as under fire conditions, intumescing and thereby closing the gaps provided by the louvres.

By the "back of the panel" we mean the face of the panel which is unexposed when the panel is in position e.g. mounted on a door or on a ventilation duct at its inlet or outlet.

The panel may have an array of angled louvres, on the rear sides of which is present the intumescent material, the intumescent material when exposed to elevated temperature, such as in the event of a fire, intumescing to close the spaces between the louvres and thereby to prevent passage of smoke, fire and combustion gases between the louvres.

By "angled louvres" we mean louvres at an acute angle to the general plane of the panel and by the rear sides of the louvres, we mean the sides which are unexposed when the panel is in position e.g. mounted on a door or a ventilation duct.

The louvre panel device may include, attached to the panel and at the back of the panel, wire mesh or perforated metal sheeting which extends over the gaps provided by the louvres. The wire mesh or perforated sheeting assist in retaining the intumescent material in position, conducting heat to the intumescent material under fire conditions, and when the intumescent material intumesces assists in directing the expansion of the material such that

the gaps provided by the louvres are closed.

In accordance with a third aspect of the invention, there is provided a panel device for an opening, such as a ventilation opening, comprising a panel having perforations formed therein, a tubular flange extending rearwardly from each perforation and having present on its inner surface a coating of intumescent material, as opening through each tubular flange being left, the intumescent material, when exposed to elevated temperature, such as in the event of a fire, intumescing to close the openings through the tubular flanges and thereby to prevent passage of smoke, fire and combustion gases through the tubular flanges. It will be appreciated that this panel has tubular flanges as a substitute for louvres.

The invention is further described below with reference to the accompanying drawings, wherein:

Figure 1 is a front view of a first panel device according to the invention;

Figure 2 is a section along line II—II of Figure 1;

Figure 3 is an enlarged view of part of Figure 2 showing louvres with coatings of intumescent material;

Figure 4 is a front view of a second panel device according to the invention;

Figure 5 is a section of an enlarged scale, along line V—V of Figure 4;

Figure 6 is an enlarged view of part of Figure 4, showing tubular flanges with coatings of intumescent material.

Figure 7 is a front view of a third panel device according to the invention;

Figure 8 is a rear view of the device of Figure 7;

Figure 9 is an exploded perspective view of a first ventilation unit including the device of Figures 7 and 8;

Figure 10 is a front view of a fourth device according to the invention;

Figure 11 is a rear view of the device of Figure 10;

Figure 12 is an exploded side view, partly in section of a second ventilation unit according to the invention;

Figure 13 is a front or rear view of liner and spacer assembly for the second ventilation unit;

Figure 14 is a plan view of the liner and spacer assembly of Figure 13; and

Figure 15 is a front view of a sliding plate for the liner or spacer assembly.

In the drawings, like reference numerals indicate like parts in Figures 1 to 6. Similarly like reference numerals indicate like parts in Figures 7 to 15.

Referring to Figures 1 to 3 of the drawings, a louvre panel device includes a panel 1, which comprises a square surround or frame 2 having a central square aperture 3 across which extend a plurality of uniformly spaced parallel louvres 4. As shown in Figure 2, the louvres are inclined at an acute angle to the general plane of the panel.

The surround 2 is provided with screw holes 6 by means of which it can be attached to a door or wall 7 to cover a ventilation opening (such as an opening simply to allow flow of air through the door in either direction or an inlet or outlet opening of a ventilation duct extending through the wall) but to



allow air flow through the panel between the louvres.

In the event of a fire adjacent the louvre panel device, the intumescent material 8 becomes raised to an elevated temperature and intumesces, that is to say it expands to become a coherent voluminous fire-resistant mass, as indicated by the dotted lines 8' in Figure 3. The voluminous material closes the gaps or spaces between the louvres 4 thereby preventing passage of smoke, combustion gases and the fire itself past the louvre panel.

Some of the intumescent material 8 may be provided at 8a between the uppermost louvre 8 and the surround 2 so that any gap between the louvre 8 and the top portion of the surround 2 is also closed in the event of a fire. Alternatively the top portion of the surround 2 may be integral with, joined to, or closely adjacent the uppermost louvre so that there is no gap or only a very narrow gap between the top portion of the surround and the uppermost louvre. A lip 2a may be provided along the lower portion of the surround 2 to assist in closing the gap between the lower portion of the surround and the lowermost louvre 8 when the intumescent material intumesces.

Figures 4 to 6 shows an alternative panel device for a ventilation opening. The panel device differs from the panel device of Figures 1 to 3 in that instead of louvres, the central area of the panel 1, within the surround or frame 2 consists of a sheet 13 provided with a plurality of perforations 13' (only some of which are shown in Figure 4) from each of which extends rearwardly a tubular flange 14. The inwardly facing surface of each flange is covered by a layer of intumescent material 8 through which an opening 16 is left for ventilation air.

In the event of a fire, the intumescent material, when it becomes raised to an elevated temperature, intumesces to become a coherent voluminous fire-resistant mass as indicated by reference number 8' thereby blocking the opening 16.

The perforations 14 may, for example, be arranged in a hexagonal array (as shown) or a square array.

If desired, the panel 1 in either the embodiment of Figures 1 to 3 or the embodiment of Figures 4 to 6, when mounted on the door or wall 7, may be bedded on intumescent material so that, in the event of fire, seepage of smoke, combustion gases and the fire itself between the surround 2 of the panel and the door or wall is prevented, even if the door or wall warps.

The panels 1 (including the louvres or the tubular flanges) are preferably made of metal, such as aluminium or steel, which is a good thermal conductor, to assist conduction of heat to the intumescent material.

The intumescent material referred to above and used in the present invention may be intumescent material formed on hardening or setting of the mastic or putty described in our patent application no. 8204488. Thus the putty or mastic may be applied to either panel 1 referred to above, in particular to the rear surfaces of the louvres 4 and at position 8a or to the inner surfaces of the tubular

flanges 14, and allowed to harden to form the intumescent material.

It may alternatively be possible to utilize intumescent material as described in our British patent No. 1601131.

Referring to Figure 7, a louvre panel device 1 comprises a metal panel 2, having forwardly projecting louvres 3, the louvres providing gaps 4 for passage of ventilation air.

Apart from the louvres 4, the panel 1 is flat. The panel is provided adjacent opposite edges with holes 5 for screws for fixing the panel to a door.

Referring to Figure 8, on the rear side of the panel 1, is provided intumescent material 6. (The intumescent material is bounded by a generally irregular line in the Figure). The intumescent material 6 adheres to the panel 1 and is further retained in position by metal wire mesh 7, preferably of steel, which is partially embedded in the material at areas A. The wire mesh 7 is itself held in position by two metal strips 8 which are attached to the panel 2 by screws 9 passing through holes in the panel. As can be seen, the intumescent material defines apertures 10 into which the gaps 4 of the panel open. Thus despite the presence of the intumescent material 6 ventilation air can pass readily through the panel.

In manufacturing the device 1, the louvres 2 are cut and pressed from the panel 2 to provide the gaps 4. Then intumescent putty or mastic (or other composition which hardens to form intumescent material) is deposited on the panel 2 around the gaps 4. Whilst the putty or mastic (or other composition) is still soft the wire mesh 7 is pressed into the putty or mastic (or other composition) and secured in position by the strips 8 and the screws 9. The putty or mastic (or other composition) subsequently hardens to form a solid coherent mass of the intumescent material 6 which adheres to the panel 2.

The panel 2 is made of metal, such as aluminium or steel, and the wire mesh is also made of metal. Thus when the device 1 is exposed to elevated temperature such as under fire conditions heat is rapidly conducted to the intumescent material. The intumescent material then intumesces, i.e. expands to form a voluminous coherent fire-resistant mass. Due to the presence of the wire mesh 7, the intumescent material is constrained to expand laterally rather than rearwardly of the plate and thereby expands across and blocks the gaps 4 preventing smoke, combustion gases and fire passing through the gaps.

It is intended that the device 1 may form part of a ventilation unit for fitting to a door at a ventilation opening provided in the door. Referring to Figure 9, the assembly comprises the device 1, a like device 1' and a liner or spacer 11.

The liner 11 is a square or rectangular metal box section and should be of the same width w as the thickness of the door. The liner 11 is fitted into the ventilation opening, and the panel device 1 is secured to one face of the door or wall to cover the opening and the panel device 1' is secured to the other face of the door or wall to cover the opening,

both panel devices 1 and 1' being secured to the door or wall with their rear sides facing into the opening. The screws which are used for fixing the panels 1 and 1' to the door also pass through holes in lugs 17 of the liner 11 to hold the panels and the liner securely together. Preferably the devices 1 and 1' are bedded in intumescent putty or mastic when secured to the door. Optionally also intumescent putty or mastic surrounds the liner 11.

In the event of a fire, heat is rapidly conducted to the intumescent material of one or both panel devices 1 and 1'. The intumescent material then intumesces to provide a voluminous coherent mass of fire-barrier material thereby to close the gaps 4 provided by the louvres and prevent smoke, combustion gases and the fire passing through the opening.

Referring to Figures 10 and 11, a further panel device is shown. This is intended for mounting on an inlet or outlet of a ventilation duct and differs from the louver panel device shown in Figures 7 and 8 only in that the panel 2 has two arrays 13 of louvres and a rearwardly flanged edge 14 and would be of a somewhat larger size. Further an additional screw 15 passing through the panel 2 and a piece of metal 16 serve to hold the wire mesh 7 in position at its centre.

The device of Figures 10 and 11 is made similarly to the device of Figures 7 and 8 and functions in a similar manner.

Referring to Figures 12 to 15, a ventilation unit comprises a liner and spacer assembly 20 and two louver panel devices 1 and 1' similar to the device 1 shown in Figure 7 and 8. The intumescent material and wire mesh are not shown in Figure 6 for the sake of clarity.

The liner assembly 20 is generally square or rectangular with top, bottom and side walls or webs 21. The side walls 21 are formed with flanges 22 to the insides of which are attached vertical members 23 formed with channels 24.

Two plates 25 are slidable in the pairs of channels at the front and back of the liner assembly 11 respectively. Each plate has a plurality of apertures 26 (shown only in Figure 9). Furthermore each plate 25 is slidable when the ventilation unit is assembled, between an upper position in which the apertures 26 are in registry with the gaps 4 defined by the louvres 3 and a lower position in which the apertures are out of registry with the gaps and the plate blocks the gaps.

Within the liner assembly 20 is provided a solenoid or electrical relay (not shown) intended to act upon the plates 25 and normally hold them in their upper position. The plates may be connected together by a member on which the solenoid or electrical relay acts to normally hold the plates in their upper position. The solenoid or electrical relay is conveniently located within the upper portion of the liner assembly above the louvres and adjacent the top wall 21.

There may also be a smoke detector or sensor (not shown) provided within the liner assembly and connected to the solenoid or electrical relay.

The ventilation unit is fitted to a ventilation

opening in a door. The liner assembly 20, which is preferably of the same thickness as the door, is fitted into the ventilation opening and the panel devices 1 and 1' are fitted on opposite faces of the door to cover the ventilation opening. The plates 26 are thus each disposed closely adjacent one of the panels 1 and 1'. The liner assembly 20 may be surrounded by intumescent putty or mastic and the devices 1 and 1' may be bedded in intumescent putty or mastic. The devices 1 and 1' may be screwed to the liner assembly 20, the liner assembly being firmly secured to the door, or may be screwed direct to the door.

The solenoid or electrical relay is connected either to the smoke detector referred to above or to a smoke detector external to the ventilation unit, e.g. on a ceiling of a room adjoining the door.

Normally the plates 25 are held in their upper position so that air is free to pass through the gaps 4 and thus through the ventilating unit.

If smoke is detected by the smoke detector connected to the solenoid or electrical relay, the solenoid or electrical relay releases the plates 25 allowing them to drop to their lower position and thereby blocking the gaps 4 and preventing air and smoke passing through the ventilating unit.

In the event of a fire, heat is rapidly conducted to the intumescent material of one or both panel devices 1 and 1'. The intumescent material then intumesces to provide a voluminous coherent mass of fire-barrier material thereby to close the gaps 4 provided by the louvres and prevent smoke, combustion gases and the fire passing through the opening.

The ventilation units described above may be fitted into ventilation openings in walls instead of doors, the width of the liner 11 or liner assembly 20 being selected preferably to be the same as the thickness of the wall.

The ventilating unit shown in Figures 12 to 15 may incorporate louver panel devices as shown in Figures 1 to 3 or Figures 4 and 5 or the panel device shown in Figures 4 to 6 instead of louver panel devices as shown in Figures 7 and 8.

In the louver panel devices shown in Figures 7 to 12, the intumescent material 6 is provided mainly or wholly on areas of panel 2 around and between the louvres 3, i.e. not on the rear of the areas of the panel forming the louvres. Alternatively or additionally the intumescent material may be provided on the rear of the areas of the panel forming the louvres provided that passage of air through the gaps 4 is not unduly obstructed. To this end the louvres 3 may be formed as shallow troughs to receive the intumescent material.

The louver panel devices shown in the drawings may if desired be used as speaker grilles.

The intumescent putty or mastic referred to above may be as described in our British patent application no. 8204488.

#### CLAIMS

1. A panel device for an opening, comprising a panel having perforations formed therein, a tubular flange extending rearwardly from each perforation

- and having present on its inner surface a coating of intumescent material, an opening or passage through each tubular flange being left, the intumescent material, when exposed to elevated temperature intumescent to close the openings or passages.
2. A panel device according to claim 1, wherein the panel is of material of high thermal conductivity.
3. A louvre panel device for an opening, comprising a panel provided with one or more louvres and which carries intumescent material on its back, the intumescent material when exposed to elevated temperature intumescent and thereby closing the gaps provided by the louvres.
4. A louvre panel device according to claim 3, wherein the panel is of material of high thermal conductivity.
5. A louvre panel device according to either of claims 3 and 4, having an array of angled louvres, on the rear sides of which is present intumescent material, the intumescent material when exposed to elevated temperature intumescent to close the gaps between the louvres.
6. A louvre panel device according to any of claims 3 to 5, wherein perforate material extends over the gaps provided by the louvres.
7. A louvre panel device according to claim 6, wherein the perforate material is material of high thermal conductivity.
8. A louvre panel device according to claim 7, wherein the perforate material is wire mesh.
9. A panel device for an opening substantially as described herein with reference to and as illustrated in any of Figures 1 to 3, Figures 4, 5 and 6, Figures 7, 8 and 9 or Figures 10 and 11 of the accompanying drawings.
10. A combination comprising a panel device according to any preceding claim and means for closing the gap or gaps provided by the louvre or louvres in response to detection of smoke.
11. A combination according to claim 10, wherein said means comprises a movable plate, which in one position closes the gap or gaps and in another position leaves the gap or gaps open.
12. A combination according to claim 11, wherein said plate has one or more apertures which are in registry with the gaps when open and out of registry with the gaps when closed.
13. A combination according to claim 12, substantially as described herein with reference to and as illustrated in Figures 7 to 15 of the accompanying drawings.
14. A ventilating unit for a ventilation opening, comprising a pair of louvre panel devices according to any preceding claim for covering opposite sides of the opening, one or both of which devices may be in combination according to any of claims 11 to 13, and liner and/or spacer means for insertion in the ventilation opening.
15. A ventilation unit according to claim 14, substantially as described herein with reference to and as illustrated in Figure 9 or Figures 12 to 15 of the accompanying drawings.